MC0093

HOSPITAL BUILDING NOTE

DEEP PLAN (RACE-TRACK) WARD UNITS

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MINISTRY OF HEALTH : LONDON : HER MAJESTY'S STATIONERY OFFICE
MAY 1963 PRICE 2s. 0d. NET

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An addendum to Appendix E of Hospital Building Note No. 2, *The Cost of Hospital Buildings,* which sets out cost recommendations for Deep Plan (Race-Track) Ward Units is supplied with this Building Note.

I. Introduction

Scope

1. This Building Note gives interim guidance on planning ward units in depth. It is supplementary to the present Building Note No. 4 which deals with the design of acute medical and surgical ward units for district general hospitals. A revised Building Note No. 4 is in preparation and to the extent that this Note is affected, further guidance on deep plan ward units will be included in the revise.

2. This Note has been limited to the study of a 60-bed ward floor, planned in different ways to illustrate the effects of shape and layout on cost and efficiency. The implications of a larger number of beds per ward floor will be dealt with in the revised Building Note No. 4.

3. This Note sets down some of the most important points to be borne in mind in designing a deep plan ward unit so that its best features can be fully exploited. For the purposes of the detailed comparison of ward plans the basic and additional accommodation described in Building Note No. 4 for ward units of about 30 beds has been used, though certain minor modifications have been made where a shared central supply area for the floor has been shown.

Definition

4. The terms "deep plan" or "race-track" are applied to ward unit plans in which some or all of the ancillary rooms are internal, the bed areas and other rooms being on the periphery. They include plans of double-corridor, square (or near square), triangular or circular layout and may also be applied loosely to plans in which only a small part of the ancillary accommodation is located internally, the remainder being disposed in the conventional way. This latter type of layout is referred to as a "semi-deep plan." Appendix A gives a glossary of terms used in the Note.

Origins

5. This type of planning was first developed in small hospitals in the United States of America during the war. Many of the United States layouts have been developed round a vertical supply and disposal shaft connected to a supply floor at a lower floor level. By this arrangement the supply routes are made short and quick and maximum use is made of mechanical communication systems.

6. Conditions in the U.S.A. are different from those in this country; for example, for climatic reasons many hospitals require cooling whether deep plan layouts are used or not, and low winter temperatures make heat losses more critical.

II. General considerations

7. This Note is primarily intended to describe the special characteristics of deep plan 60-bed ward units in order that their use might be considered in circumstances in which single-corridor plans present a difficulty. These circumstances will usually arise from site considerations since one of the main characteristics of the deep plan is its economy in length and overall perimeter. It has certain operational advantages but, from the limited experience so far available, these do not seem to justify the greater capital and running costs involved, in any but exceptional circumstances.

External and structural factors

8. Some of the principal advantages of deep plan ward units lie outside the confines of the ward accommodation. Where the site is small, or land is costly, or there is an amenity value to the land, it will be preferable to occupy as little space as possible and to build compactly. While this does not necessarily imply the adoption of a deep plan, such a design may offer a better use of the site.

9. In some circumstances it may be necessary to employ mechanical ventilation in the ward accommodation because of extreme external factors (e.g. exposure, noise, smell or atmospheric pollution) or to compensate for excessive internal flue effects. In such cases this might be more economically provided in a compact type of building than in one based on a single-corridor type of layout.

10. Other external factors to take into account are height restrictions, overlooking from adjoining buildings, angles of light, phasing of the hospital development and the problem of integrating with existing buildings while maintaining an uninterrupted service.

Factors in planning

11. Changes in medical requirements and techniques of nursing are likely to be more easily assimilated in wider plans of simple shape than in narrower ones.

A. *Design implications of the central core*

12. The fact that some or all of the ancillary rooms in a deep plan ward unit are grouped together as a central core has certain implications for the organisation of the hospital. It is essential that, where such a plan is adopted, the design of the central core should be carefully considered so that full advantage can be taken of the special characteristics of this type of layout.

(i) *Utility areas*

13. With a deep plan it becomes easier, as compared with a single-corridor plan, to group the utility areas (i.e. the clean and dirty utility rooms, cleaners' room and equipment stores) for the whole nursing floor round one shared delivery and disposal point, i.e. the lifts and hoists connected to the supply floor. This facilitates the employment of a centralised system for supplying goods to all departments from one area—provided always that the supply departments themselves can be concentrated on the lower floors. The grouping of vertical supply shafts with the main passenger lifts, see Figure 1, is also less inhibiting to planning on other floors than a system of vertical supply shafts arranged to deliver direct to scattered supply points on the ward floor, see Figure 2.

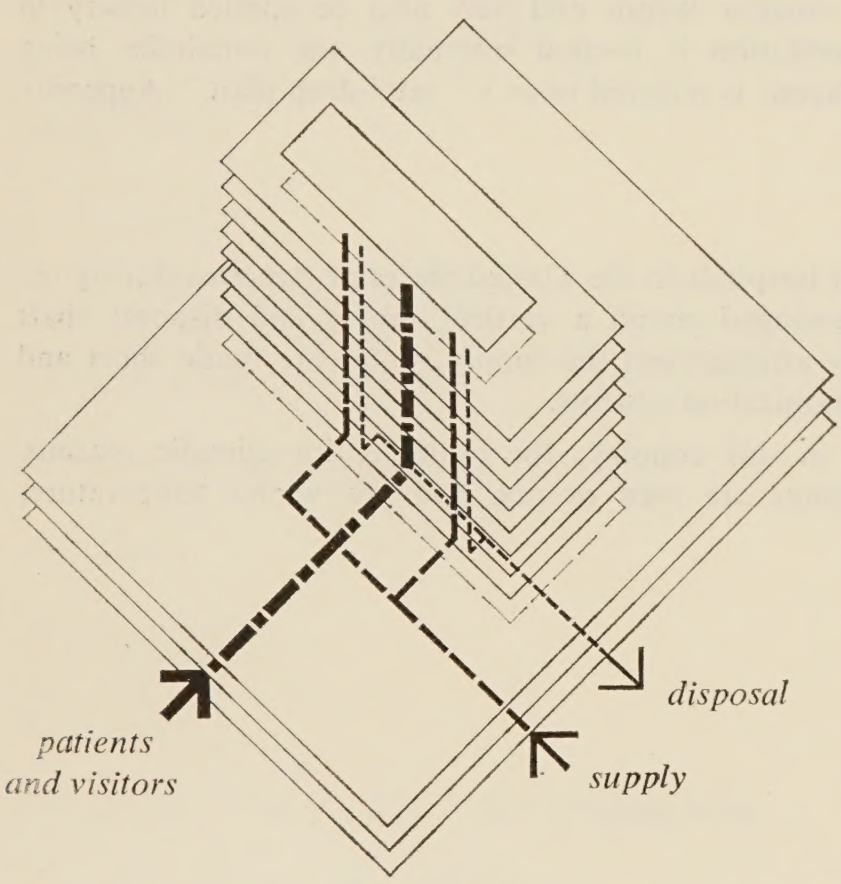


FIGURE 1. 2

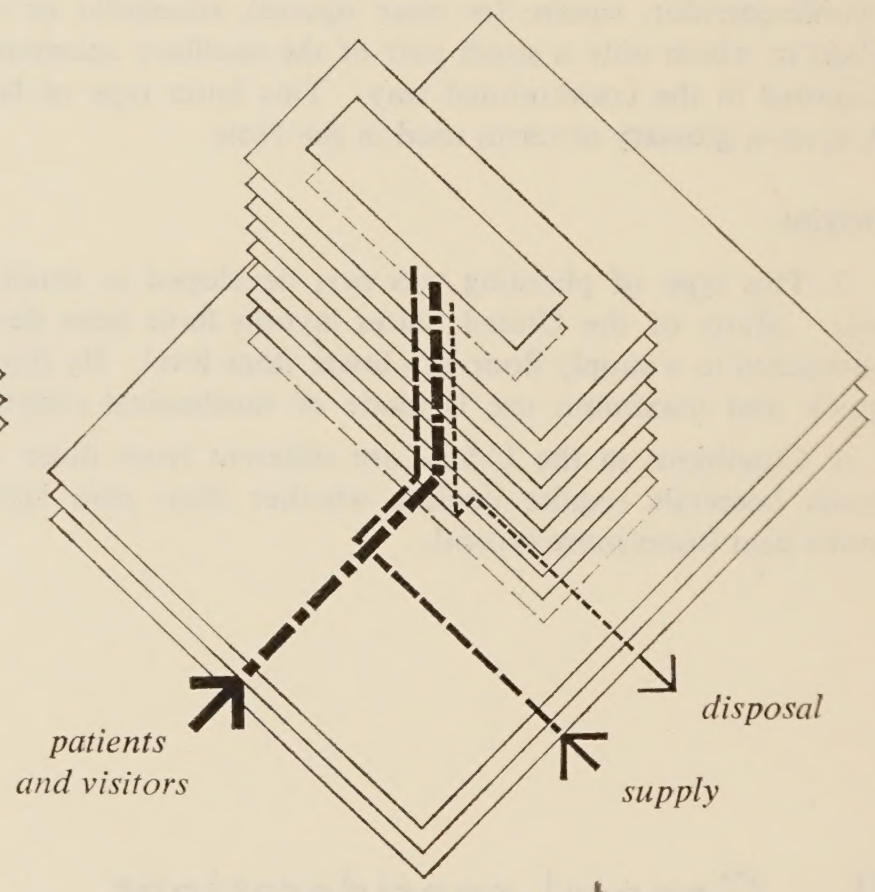


FIGURE 2. 1

14. The implications of grouping together the supply departments, i.e. pharmacy, central sterile supply department, central stores and possibly the catering department, will be examined in another Building Note.

(ii) *Treatment rooms*

15. There are advantages in planning treatment rooms *en suite* with the clean and dirty utility rooms so that dressings and other procedures can be dealt with quickly. On the other hand, the treatment rooms should be as close as possible to the multi-bed bays or rooms. If a shared central utility area is proposed it may prove impossible to satisfy both these requirements. In this event it may be necessary to plan "sub-utility" bays, with hatches opening into the treatment rooms: these could be supplied and cleared from the shared central utility area at regular intervals, or immediately before and after a series of treatments.

(iii) *Food service*

16. In a deep plan it may be simpler than in a conventional layout to provide one central pantry for the ward floor, which can be served by lift or hoist direct from the main hospital kitchen. This could be a more economical arrangement than individual pantries, each served by decentralised hoists, or alternatively, served horizontally from a central hoist on the ward floor. On the other hand, proximity to dining space is an important consideration when locating the pantry on the ward floor and much traffic will also take place between the pantry and the bed-fast patients who may be in multi-bed or single rooms. It may not be possible for all these requirements to be met from one central pantry, in which case sub-pantries may have to be provided.

(iv) *Nursing considerations*

17. Proximity of ward units to one another on the same floor level in compact layouts may make possible the more effective use of available trained

nursing skill, particularly at night. The nurses' stations must, however, be carefully sited. Supervision of patients by day is largely accomplished in the course of the nurse going about her normal duties, and the nurses' station needs to be positioned merely to form a focal point for ward administration. By night, however, a nurse is likely to be at a nurses' station for longer periods of time and it is important that its position should be near the areas likely to be used for the more seriously ill patients, and within easy reach of either the central shared utility area or a sub-utility point.

18. Deep plan ward units can vary in the proportion of ancillary rooms placed internally. Staff and patients may only be in these rooms for short periods at a time and for a small part of the day, much of their time being spent in the bed areas or in movement between bed areas and other rooms. Nevertheless as much as possible should be done in detail design and treatment of space to offset any tendency for internal rooms to be oppressive. Corridors ending in well-lit areas or with view windows assist in giving a sense of space and openness.

19. Since the layout of a deep plan design is more complex than that of a single-corridor design, it may be more difficult for nurses to keep in touch with the movements of other staff and visitors. Observation through the core can be facilitated if some of the partitions are partly glazed, but care must be taken to ensure that artificial lighting does not cause annoyance to patients by day or night (see under Engineering services IV). Furthermore, there may be the need for additional patient/nurse call system indicators or a more precise location system to help the nurse keep in touch with patients or to go to the assistance of another nurse.

(v) *Control of infection*

20. Ways in which deep plan layouts may affect the control of airborne infection are difficult to foresee. Such layouts inevitably mean a wider use of mechanical ventilation than in the case of conventional designs, but experience is lacking on the extent to which this can be expected to influence the control of air movements.

B. *Continuous banding of bed areas*

21. A deep plan design facilitates the placing of all the patients' bed areas as a continuous band round the periphery of the unit. This adds to the prospect of varying the size of bed groups to meet changes in requirements and therefore offers greater flexibility in their use. It thus contributes to the solution of the problem that, with a continually fluctuating demand on the use of beds in a district general hospital, a fixed size of ward unit is not the most efficient way of using the in-patient accommodation. Fluctuations in demand are caused by seasonal variations in waiting lists, differences between male and female distribution in various specialties (either temporary or permanent), changes in size and importance of specialties, a sudden influx to a ward admitting emergencies, and so on.

22. Notwithstanding any central provision for post-operative recovery or intensive therapy, it may be desirable to group together on a ward floor patients requiring constant attention. With a deep plan design, this could be in the form of a multi-bed area, with a few single rooms, sited close to a utility area and shared by two ward units. Grouping together of the more seriously ill patients of two ward units in this manner may, however, involve a separate nurses' station and the implications arising from it.

23. Some types of deep plan layouts can assist to a small extent in reducing the walking distance of nurses in the ward unit. Appendix B gives the results of a study of walking distances. The plan with the lowest walking distance factor is that of the double-corridor type. The location of important rooms and the effect this has on patterns of essential and frequent journeys may, however, be a more important factor than compactness in reducing the amount of walking.

24. The number and grades of nursing staff needed to run a ward unit cannot at this stage be shown to be less in a deep plan as compared with a conventional layout. All that can be said is that a well-designed deep plan layout may make for greater ease of nursing care.

III. Comparison of ward plans

25. Figures to represent a number of different types of ward layout are given to illustrate certain design features in deep plan and single-corridor layouts.

26. The first group of plans (A to D, Figures 3 to 9) show each ward unit as a separate entity, with its own utility area served independently by lifts or hoists from the supply floor.

27. The second group of plans (E to G, Figures 10 to 12) shows how the bed areas can be arranged to give greater administrative flexibility of bed use: also the main ancillary rooms are centralised, being grouped round a single delivery and disposal point for the whole ward floor.

28. Plan A, Figure 3, is a conventional single-corridor plan. It is a simple plan with good natural light and ventilation and no overlooking problems. The length of the block may, however, make it difficult to build on restricted sites. The scattered siting of vertical shafts could inhibit planning on other floors if variation of the basic ward layout were needed or other departments were planned on ward type floors. The narrowness of the block may also restrict freedom in the arrangement of rooms which have important relationships with one another.

29. Plan A (i), Figure 4, is a variation where the bed areas can be continuous along one side of the block, enabling some variation in the size of the ward units to be made as the need arises. Alternatively a shared central supply area can be located between the ward units and all the lifts and hoists grouped together.

30. In both plans the placing of the service lifts or hoists in the centre of each ward unit would involve two separate sending and receiving points. This may not be convenient or economical in use. It does, however, mean that goods arrive at the most convenient point in the ward.

31. Plan B, Figure 5, is less extensive than plan A and could be adopted on a more restricted site but suffers from one wing overlooking another. Super-

KEY TO FIGURES 3-13

Patients' bedrooms and day spaces (including w.c's to single rooms only)

Ancillary accommodation—utility rooms, treatment rooms, servery, sister's office, sluice room and patients' sanitary accommodation

Ancillary accommodation—staff cloakroom, doctors' room, relatives' room, cleaners' room and waiting area

Circulation area

Stairs and vertical ducts

Passenger, bed and goods lifts

Goods lift or hoists (where independent of main lifts and hoists)

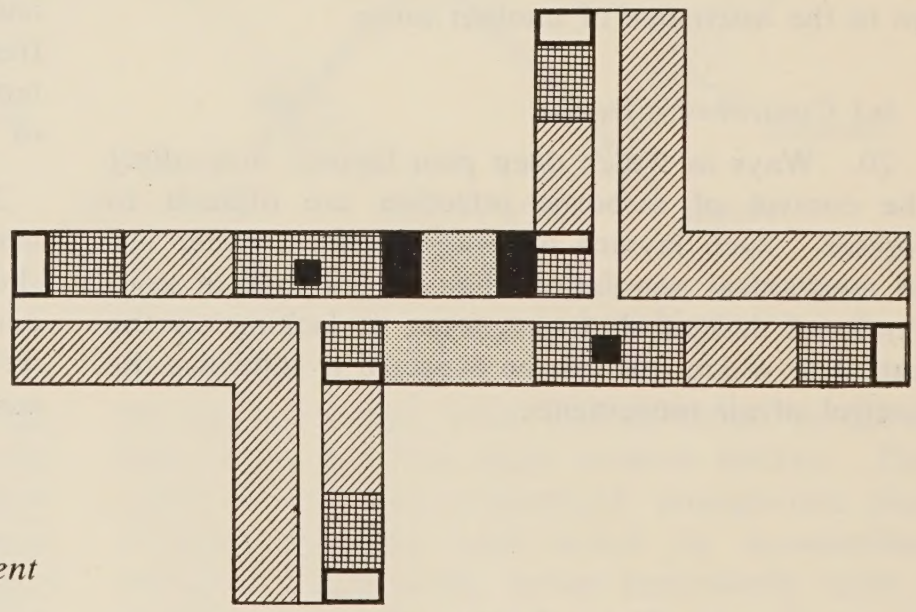


FIGURE 5. Ward plan type B.

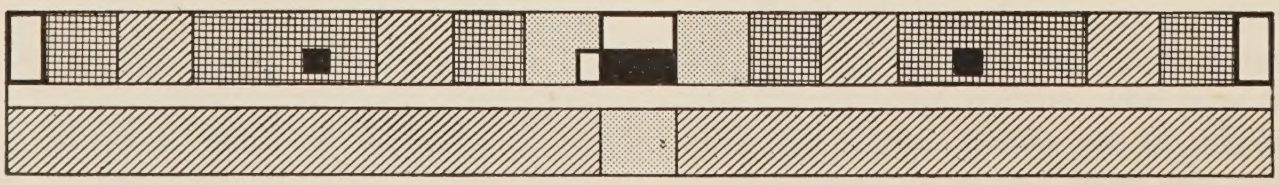


FIGURE 3. Ward plan type A.

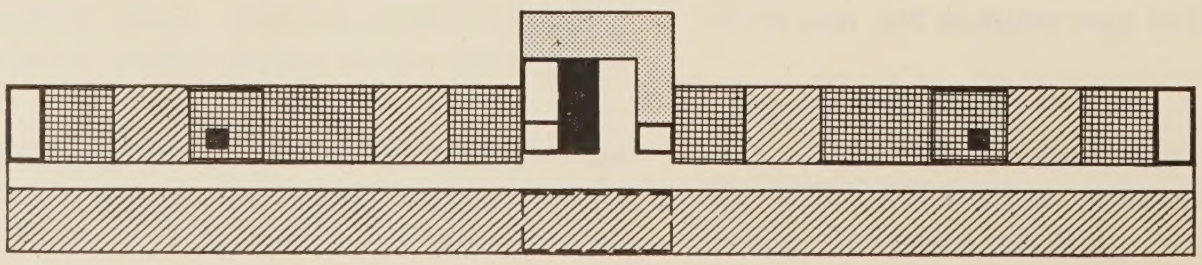


FIGURE 4. Ward plan type A (i)

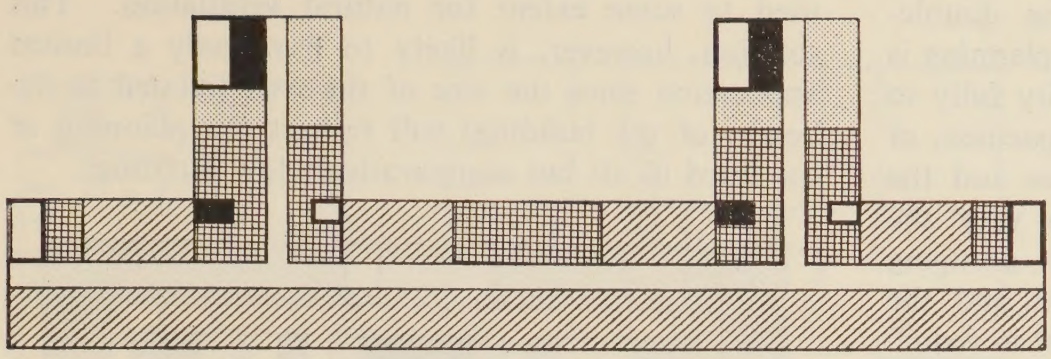


FIGURE 6. Ward plan type B (i).

vision may not be so good as in plan A, owing to the separation of each ward unit into two wings.

32. This layout does not permit any continuity of bed space which would enable variation in the size of the ward unit, but this can be achieved as shown in plan B (i), Figure 6. This plan has the disadvantage of requiring two widely separated banks of lifts and hoists for both goods and persons, which is generally an inefficient arrangement.

33. Plans C and C (i), Figures 7 and 8, are both deep plans with double-corridor layouts which are advantageous where the site is restricted. The closer grouping of the bed areas round the ancillary rooms makes for shorter journeys within the ward unit than in plans A and B, but the planning tends to become more complex and direct visual supervision may not be so good as in the more simple layouts. The location of the central ancillary accommodation in plan C cuts off one ward unit from the other, but plan C (i) shows how greater continuity can be achieved with advantages in flexibility of bed arrangement.

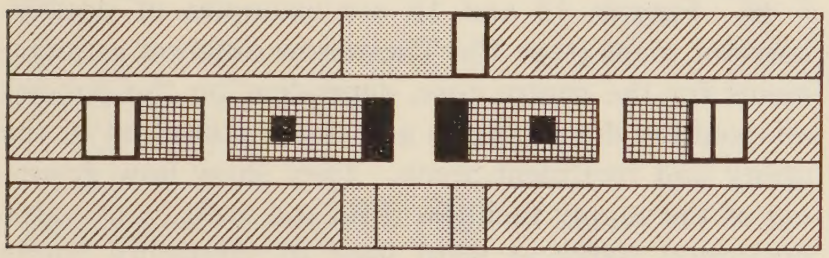


FIGURE 7. Ward plan type C.

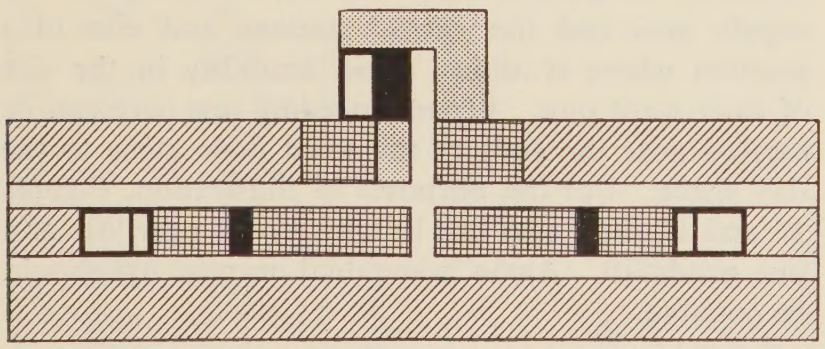


FIGURE 8. Ward plan type C (i).

34. In both plans C and C (i) the wider floor makes it easier to plan for complex room relationships and to vary the layout from one floor to the next.

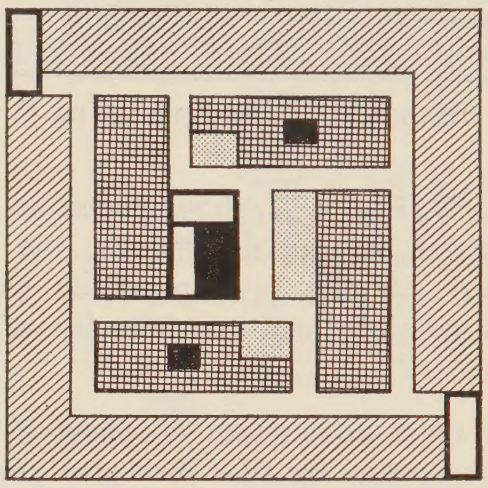


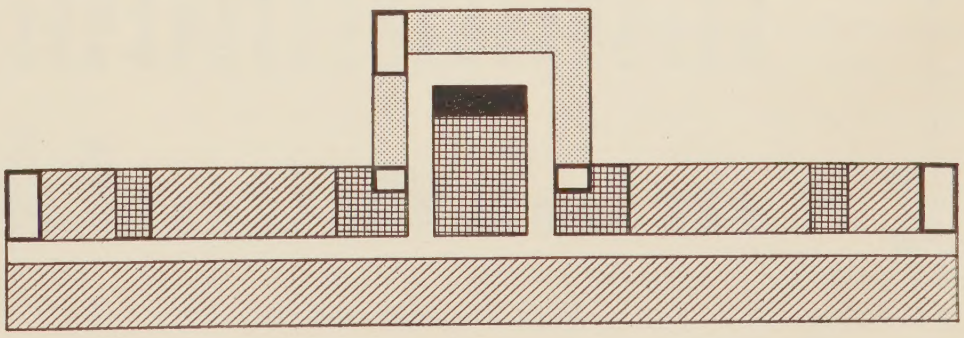
FIGURE 9. Ward plan type D.

35. Plan D, Figure 9, shows the same principles carried a stage further with almost complete continuity of bed space round the perimeter of the floor. But a major disadvantage is the complex arrangement of rooms in the inner core area. While this solution may be the most compact in extent the overall area is likely to be larger than in plans A to C owing to the increased area of corridors in the core.

36. The separate supply receiving points for each ward unit in both plans C and D are closer together than in plans A and B, but the same disadvantages as mentioned above still apply.

37. Plan E, Figure 10, is mainly a single-corridor plan, but wider than type A and incorporates a deep plan core. It has the advantages of simplicity and relies on natural light and ventilation for the larger part of the ancillary accommodation as well as for the bed areas. It is more compact than plans A and B and in some circumstances offers a useful compromise between a conventional and a deep plan layout.

FIGURE 10. Ward plan type E.



38. Plan F, Figure 11, illustrates the double-corridor type of plan. This form of deep planning is adaptable in use and offers the opportunity fully to utilise a central supply system. The compactness of the plan makes it suitable for small sites and the wide floor gives greater opportunity to vary the layout on different floors. The compact grouping of the rooms around the nurses' station and the ancillary rooms can assist to a slight extent in reducing unnecessary walking in the wards.

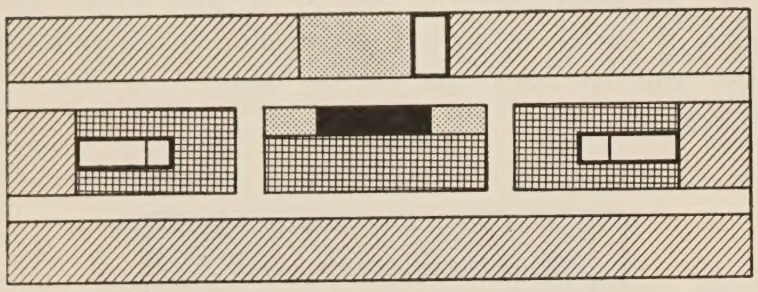


FIGURE 11. Ward plan type F.

39. Plan G, Figure 12, shows the same concept in a square form but, as in plan D, the core area becomes very complex by comparison with plan F and would possibly lead to difficulty of adequate supervision.

40. The main advantages of plans E, F and G over the first group are that they give greater scope for adaptability of layout and grouping of beds and, by grouping the lifts, hoists and ducts into one central area, the larger part of the floor is left clear of these immovable obstructions. They also make possible the provision of a bed area common to both ward units, where patients requiring most care, particularly at night, could be nursed close to the central utility rooms.

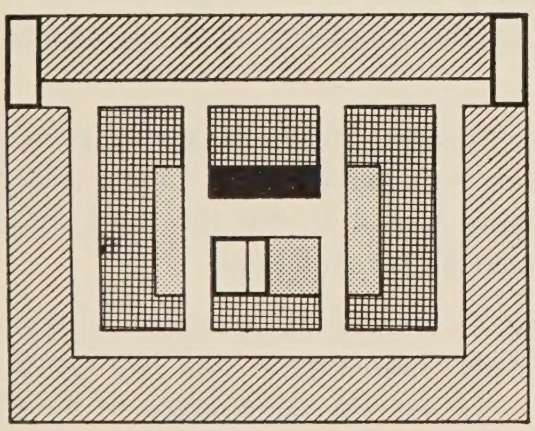


FIGURE 12. Ward plan type G.

41. Plan H, Figure 13, is a variation of plan F incorporating internal light wells which could be used to some extent for natural ventilation. This solution, however, is likely to have only a limited application since the size of the well (related to the height of the building) will restrict the planning of the ward in all but comparatively low buildings.

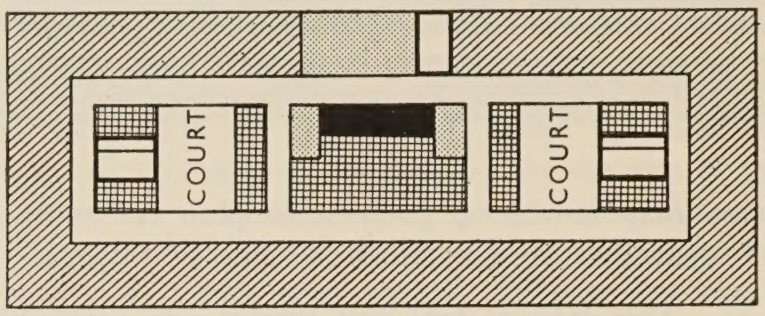


FIGURE 13. Ward plan type H.

Detailed plans A and F

42. Three layouts are included in some detail in this Note to illustrate some of the points made in the text. They should be regarded in this light and not as recommended layouts since the plan adopted for a particular scheme will depend not only on the operational policies selected for the ward itself but on those of other departments. These layouts are still within the context of a 60-bed floor.

43. Figure 14 shows a single-corridor plan, such as type A, affording simple communication between rooms, with dispersed supply points. As each ward is self-contained there is no flexibility in the size of ward unit. The number and types of lifts required would depend on an analysis of traffic. For the purposes of illustration Figure 14 shows two bed lifts, two passenger lifts and two goods hoists, the centre group having dual purpose functions.

44. Figures 15 and 16 are examples of double-corridor plans (type F). They show different arrangements for the centre core, dependent on the policies adopted for the supply to and the organisation of the utility and treatment areas. They show how grouping of the supply facilities (lifts and hoists) can mean horizontal traffic at ward level to sub-utility points and sub-pantries. Both show how an area for seriously ill patients can be located close to the supply area and the nurses' stations and also in a position where it allows some flexibility in the size of each ward unit. Patients needing less care can be located near the ends of the ward floor close to the day space. For the purposes of illustration, Figures 15 and 16 show two bed lifts, two passenger lifts and one goods lift. Again, some dual purpose use should be possible.

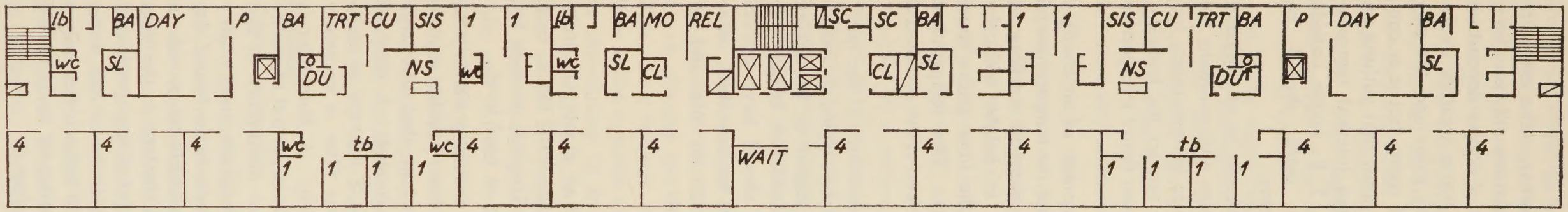


FIGURE 14. Plan A typical layout.

FIGURE 15. Plan F typical layout.

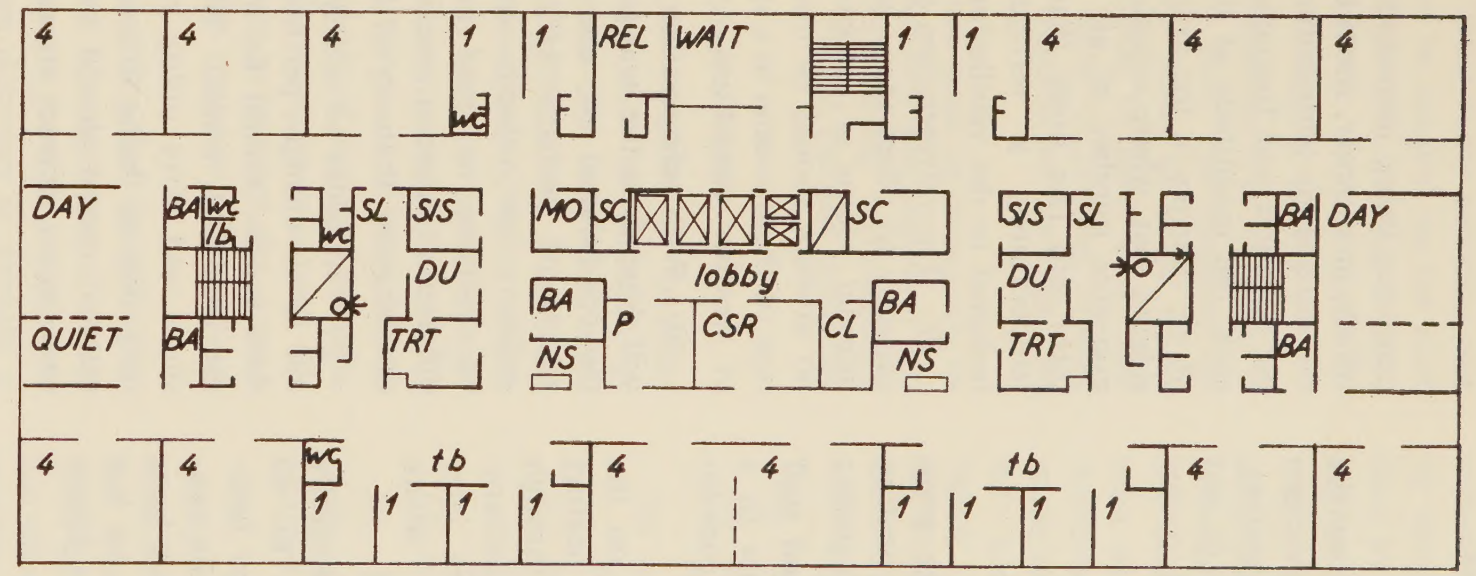
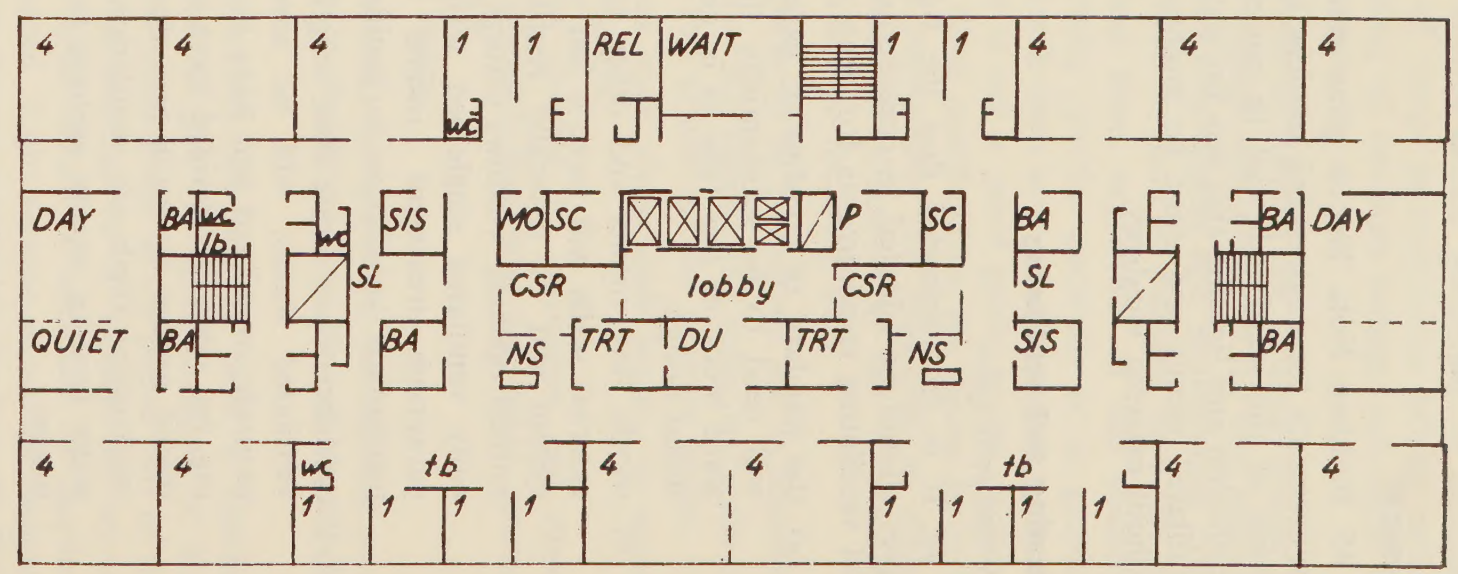


FIGURE 16.

Plan F typical layout.



KEY

1	*Single-bed room*
4	*Four-bed room or bay*
DAY	*Day room*
QUIET	*Quiet day room*
REL	*Relatives' room*
WAIT	*Waiting room for visitors*
BA	*Bathroom*
SC	*Staff cloakroom and w.c's*
SIS	*Sister's office*
MO	*Medical officer's office*
TRT	*Treatment room*
CU	*Clean utility room*
CSR	*Clean supply room*
DU	*Dirty utility room*
P	*Kitchen (or floor pantry)*
NS	*Nurses' station*
SL	*Sluice room*
tb	*Trolley bay*
CL	*Cleaners' room*
⊠	*Lift*
⊘	*Duct*
→o	*Shute*

0 10 100 feet

IV. Engineering services

General

45. Building Note No. 4 gives guidance on the requirements for engineering services in the various rooms of the ward unit, but in regard to heating, ventilation and lighting this was for naturally lit and ventilated rooms and must be modified for rooms without external windows.

Heating and ventilating

Design principles

46. It is recommended that the following principles should be adopted in considering the heating and ventilating requirements for deep plan layouts:

(*a*) the standard of comfort of patients and staff will need to be substantially the same in a ward block of this type as in one of conventional design;

(*b*) wards, day rooms and other spaces on the external walls will have a hot water heating system and be naturally ventilated through normal opening windows (except for mechanically ventilated single-bed wards—see later paragraph—treatment rooms etc., where mechanical ventilation is justifiable);

(*c*) corridors, open along their length to naturally ventilated wards, will be assumed to be naturally ventilated and have hot water heating, but corridors divided from naturally ventilated spaces by walls and doors will have mechanical fresh air ventilation and no hot water heating, except perhaps to offset fabric losses;

(*d*) the risk of airborne cross infection should not be increased: core rooms must be well ventilated to compensate for the lack of direct sunlight and of windows which can be opened to get rid of smells, and there must be adequate air movement to avoid feelings of stagnation and of being shut in.

47. The impact of requirement (*a*) above can only be on the design of the mechanical ventilating system for the core rooms in the deep plan, since it must be assumed that conditions in the naturally ventilated wards of the deep plan and conventional blocks will be similar, and Building Note No. 4 may be referred to for bed areas.

48. Except on the top floor, the core or internal rooms will not have any fabric heat losses and therefore do not require any hot water heating: indeed there will be a considerable heating effect from the necessarily increased lighting system, certain equipment and hot pipes. It may, however, be desirable to have some background hot water heating on the top floor. The heating effect referred to, while not an embarrassment in cold weather, will cause internal temperatures to rise in warm and possibly mild weather since the ventilating air at outside temperature cannot carry away the heat without room temperatures being increased somewhat. The extent to which, in summer, room temperatures will rise above the outside air temperature will of course depend on the duration and frequency of warm weather in the area, the magnitude of the heat gains and the rate of air changes in the individual room, but it is considered that, where calculations show that without an excessive number of air changes internal temperatures will rise more than say 5° F. above outside temperatures, a refrigeration plant should be included in the ventilation scheme.

49. The refrigeration plant should be of sufficient capacity to offset these heat gains and maintain the internal rooms at external shade temperatures, but no attempt should be made to restrict the temperature of these rooms to a maximum figure irrespective of weather conditions.

50. With refrigeration the number of air changes will depend on the heat gains and the temperature of the conditioned air, and for successful working in rooms of perhaps 8 ft. 0 in. in height with the ordinary low velocity system the inlet grilles must be designed to avoid draughts. The temperature differential between entering air and room air should not be more than about 10° F.

51. In order to satisfy requirement (*d*) the number of air changes per hour, while varying in individual rooms, should be in the region of 10, taking the core as a whole. While lavatories, bathrooms, sluice and dirty utility rooms should have extract only (the air being drawn from the corridor), other internal rooms should have fresh air inlet and, in some cases, extract arrangements.

Notes on installation

52. Two separate main fresh air plants will probably be necessary for the average ward block, each serving a ward on each floor. The best position for the plant rooms will usually be at roof level.

53. Main fresh air intakes should preferably be well above roof level and away from possible sources of contamination. It is important that discharge outlets should be carefully positioned. A filter of 95 per cent efficiency down to 5 microns is satisfactory but an additional coarse filter is necessary in districts where the air is dirty. A humidifier is necessary for winter use, but it is important to ensure that this does not contribute to discomfort in hot weather. Hot water heater batteries are more readily controllable than those which are steam heated for the main plant. It may be desirable to provide a small, locally controlled, heater battery in the duct serving a room where there is a lot of heat-producing equipment, for use when the equipment is not being used. Fresh air ductwork should be insulated where necessary to prevent the ventilating air being heated by local heat sources, e.g. hot pipes.

54. The refrigeration plant, if required, can either be of the mechanical compression or absorption

cooling type using steam or hot water. The latter type has the advantages of being fairly noiseless and free from vibration and can be located on the roof with the cooling tower and pumps, making a compact arrangement with relatively short lengths of chilled water piping to the ventilating plants.

55. The mechanical compression type of plant is better housed on the lowest floor and mounted on anti-vibration bases. Chilled water or brine mains need to be effectively insulated to keep them cold *en route*. Care should be taken to prevent cooling tower noises from being transmitted through the ventilating system.

56. The ventilating systems must be constantly in operation throughout the year and due regard to this must be given when considering maintenance requirements. Spare parts should include duplicate motors for the fans.

Mechanically ventilated single-bed wards

57. Rooms for infectious patients or patients especially prone to infection may be included in deep plan ward units, as indeed they may be in conventional ward units. Building Note No. 4 does not specify the ventilating requirements of such rooms and the following suggestions may be useful in this connection. The objectives are (i) when the room is occupied by a patient specially prone to infection to reduce to a low level the number of airborne bacteria within the room and (ii) when the room is used for isolating an infectious patient to prevent the spread of airborne bacteria from the room to other patient areas.

58. For a single-bed room of usual proportions, the volume is such that a level of ventilation of about 15 air changes per hour should provide a sufficient flow of air through the open doorway to prevent a flow in the opposite direction. Thus a system capable of introducing 15 fresh air changes at the end of the room farthest from the door and extracting at the rate of 30 air changes per hour at the end near the door would give the results required. Fresh air inlet and extract would operate together for infectious cases, but for cases at risk of infection the extract would be shut off.

59. Ventilation at these rates should obviate the need for refrigeration for summer use even when windows are kept closed.

Lighting

Design principles

60. The artificial lighting requirements of a deep plan need to be considered in relation to the needs of the various rooms and spaces and the varying conditions which will apply during the day and night. Daylight is psychologically desirable and, in internal rooms and corridors where this is lacking, it is necessary to have higher levels of artificial lighting during the day than is normally provided during the hours of darkness. It is recommended that the lighting system for these spaces should be designed so that an upper and a lower level of illumination can be readily obtained to suit day and night use. The reduction in lighting should preferably be obtained by switching off lamps in multi-lamp fittings, rather than by switching off complete fittings, and might be achieved by automatic means.

61. The levels of lighting for internal rooms in deep plan ward units which achieve the best balance between economy in capital and maintenance costs and compensation for lack of daylight, have not yet been established from experience in this country. American lighting practice generally is to provide much higher levels than have been accepted as necessary here and is not a good guide to our requirements. With these qualifications the figures given in the following paragraphs are suggested as giving reasonable levels of illumination for satisfactory working conditions in the ward unit.

62. The spaces to be considered are as follows:

(*a*) bed areas, day-rooms and other naturally lit rooms and spaces on the exterior walls;

(*b*) corridors open along their lengths to naturally lit rooms;

(*c*) corridors divided by partitions and doors from naturally lit rooms and other internal corridors;

(*d*) internal rooms.

63. For naturally lit spaces (*a*) the lighting standards quoted in Building Note No. 4 should be adopted.

64. The corridors (*b*) should have a lighting system designed to give the same standard of illumination as for evening use in the centre part of the bed area, i.e. an average of 10 lumens per square foot, and this level should be adequate for daytime use when required. Light sources should be designed and located so as to avoid glare for patients, and during the night those that may cause disturbance should be switched off leaving minimum necessary night lighting. Flush wall-mounted fittings placed below bed level, faced with reeded or coloured glass covers, provide an acceptable solution.

65. Corridors (*c*) should have a good standard of lighting to compensate for the lack of daylight and an average of 20 lumens per square foot would be an appropriate level for daytime use. During the evening, the level of illumination should be reduced to 10 lumens per square foot and need be no higher than 5 lumens per square foot for night time lighting. Where partitions give borrowed light to the corridors the night lighting could be as for corridors described in (*b*).

66. Internal rooms (*d*) can be divided into two groups—treatment, utility, pantry, sluice etc. and bathrooms, w.c's. etc. The levels of illumination during daylight hours should be 30 and 20 lumens per square foot respectively. During the night lower levels would be satisfactory: those quoted in Building Note No. 4 would be suitable although a minimum level of 10 lumens per square foot might be adopted. The light at the nurses' station may have a dimmer switch for evening and night use.

Notes on installation

67. Levels of illumination of the order of 20/30 lumens per square foot almost preclude the use of tungsten lamps because of their heat-producing properties, and it will usually be necessary to install fluorescent fittings. The installation cost of these is high and, to secure the lowest possible prices, fittings throughout the building should be standardised as much as possible.

68. The installation particularly in internal rooms should be designed to give visual comfort, good colour rendering and colour compatibility with daylight. Specially selected fluorescent tubes are essential.

V. Costs

69. All deep plan ward units are more expensive both to build and to run than those based on single-corridor plans. Mechanical ventilation is the main cause of the extra cost. The proportionate increase is greatest in running costs. Maintenance costs will also be higher. In the extreme case of the square type plans (D and G) the extra expenditure on engineering costs for a block of 240 beds over 20 years has been estimated to equal the capital cost of another 100 beds in a single-corridor design. For this and other reasons given earlier in this Note it is assumed that, where a deep plan is adopted, the double-corridor type (type F) would normally be preferred. The cost allowance recommended in Appendix E to Building Note No. 2 has therefore been confined to this type of design.

70. As indicated in Section III above, in some circumstances the semi-deep plan (type E) offers certain advantages as compared with the single-corridor and deep plan types. This type of plan might therefore be considered for its advantages even though engineering running costs will be slightly higher than for a single-corridor unit. The cost allowance for the single-corridor unit as described in Building Note No. 4 is applicable to the semi-deep plan unit.

VI. Conclusions

71. (1) There are certain operational advantages to semi-deep plan and some deep plan ward layouts, particularly of the double-corridor type, and these are likely to be greater in relation to the hospital as a whole than in the ward accommodation alone. Nevertheless, given their higher capital and running costs, these advantages alone do not constitute a case for the widespread adoption of deep plan wards in this country. Until deep plan designs have been put more fully to the test, therefore, they should only be adopted where there are special considerations (e.g. restricted sites, or conditions which would in any case require the building to be wholly or partly mechanically ventilated) which make other types of accommodation unsuitable. Even in these circumstances the advantages must be weighed very carefully against the extra costs involved, paying particular attention to the differences in engineering running costs.

72. These conclusions are based only on a study of a 60-bed ward floor. The implications may be different where a greater number of beds can conveniently be accommodated on a floor. This situation is being studied and will be dealt with in revised Building Note No. 4.

73. (2) Where a deep plan layout is adopted, it should exploit to the full the advantages mentioned in this Note, such as greater flexibility of ward arrangement and the grouping of supply services.

APPENDIX A

Glossary of terms used in this Building Note

Conventional ward unit	A ward unit planned with a single central corridor and usually largely naturally lit and ventilated. The width of the floor seldom exceeds about 48 feet.
Deep plan ward unit	A ward unit where all or a substantial part of the ancillary accommodation is planned as an internal core with a corridor enclosing it—the patients' rooms being on the outside.
Semi-deep plan ward unit	A ward unit in which only a small part of the ancillary accommodation is internal, the remainder being disposed in the conventional way.
Ward unit	An administrative unit of up to 32 beds and its related ancillary accommodation.
Sub-unit	A group of beds and related ancillary accommodation of which two or more make up a ward unit.
Bed room	Patients' bed space(s) shut off from the connecting corridor by a full height wall (possibly glazed) and a door.
Bed bay	As for bed room but with no door and low partition or screens to the corridor.
Ward	Patients' bed room.
Ward (or nursing) floor	A floor of the building containing one or more ward units.
Ancillary accommodation **„ rooms**	All the other rooms and spaces on the ward floor apart from the patients' bed rooms and day room and the circulation area.
Core area	The inner part of a deep plan.
Supply area	The supply lifts, hoists and chutes together with the clean and dirty utility rooms and the food receiving bay if this connects direct to the food hoist.
Shared central utility area	The clean and dirty utility rooms where these are located centrally on the ward floor and are used jointly by two or more adjacent ward units.
Supply shaft	Vertical shaft containing lifts and hoists.
Hoist	A service lift not intended for carrying passengers; delivers at 2 ft. 8 ins. or so above floor level.

Evaluation of walking distances

For each basic type of ward unit, the collective distance which a nursing team would have to walk in performing a standard set of basic nursing duties over a nominal 12-hour day has been measured. String diagrams were constructed on the basis of the "standard nursing day" (evolved by the Department of Health for Scotland, Hospital Work Study Unit) and a factor calculated in respect of each ward unit by dividing the length of string in yards by the number of beds.

It was noted that the plans A to D as a group showed an advantage over the group E to G. This is possibly the result of locating the supply and utility areas within each ward unit in the first group, whereas in the second group they are centralised for the whole ward floor.

Within each group it was also noted that the double-corridor plans (C and F) showed the lowest factor by comparison both with the more extended single-corridor plans and also the very compact square plans.

The small proportional differences in the factors suggested that all the plans were relatively conveniently planned.

It should be emphasised that the journeys represented by the walking distance factor only comprise 20 per cent to 40 per cent of the actual journeys made.

Because of other factors which affect progress around the ward floor (such as doors and corners and the complexity of the layout generally), it is clear that walking distance by itself is not a complete guide to relative economy of movement.

One of the main benefits of constructing string diagrams of this kind is the bringing to life of the plans by following the paths of essential movement. The need for improvements in room positions and siting of doors should become apparent as a result of the exercise.

Hospital Building Note No. 2. **Appendix E**

Deep Plan (Race-Track) Ward Units

Hospital Building Note No. 17

The scales of accommodation and cost recommendations are applicable to deep plan wards (acute medical and surgical) in a district general hospital. The cost allowances are based on the general principles of the double-corridor layout illustrated in Ward plan type F.

A. Basic accommodation

(*a*) Wards
  (i) Single-bed wards
  (ii) Multiple-bed wards or bays
(*b*) Day and dining space
(*c*) Treatment room
(*d*) Utility rooms
  (i) Clean utility room
  (ii) Dirty utility room
(*e*) Bathrooms
  (i) Bathrooms
  (ii) Shower baths
(*f*) Ablution facilities
(*g*) W.C's.
(*h*) Sluice room(s)
(*i*) Test room(s)
(*j*) Sister's room
(*k*) Nurses' duty room or station(s)
(*l*) Nurses' lavatory and cloakroom
(*m*) Ward kitchen or pantry
(*n*) Linen bay(s)
(*o*) Store(s)
(*p*) Cleaners' room
(*q*) Trolley or chair bay
(*r*) Flower room(s) or bay(s)
(*s*) Sundry facilities
  Small ducts, etc.
(*t*) Circulation space necessary for the above accommodation.

B. Additional accommodation

(*a*) Doctor's room
(*b*) Visitors' waiting space
  As distinct from the accommodation mentioned in (*c*) below
(*c*) Accommodation for relatives of dangerously ill patients
  Circulation space. For the purpose of the provisional cost limit the area occupied by internal circulation space and internal walls and partitions represents, on average, an addition of 48 per cent to the net floor area of basic and additional accommodation.

DEPARTMENTAL COST ALLOWANCES

1. Basic accommodation

Functional unit—the bed

The allowances are applicable to schemes providing not less than 240 beds.

(*a*) For each bed—allow £1,800

(*b*) Extra allowance for ventilation to each mechanically ventilated single-bed ward—allow £400

2. Additional accommodation

(*a*) Perimeter accommodation—allow £4 15s. 0d. per square foot
(*b*) Core accommodation—allow £7 12s. 0d. per square foot

Notes:

(i) *Engineering*

The following engineering services are included in items (1) and (2) and account for the following percentages of the total cost of the basic and additional accommodation indicated:

Basic accommodation 1 (*a*)—approximately 44-46 per cent.
Additional accommodation 2 (*a*)—approximately 28-30 per cent.
Additional accommodation 2 (*b*)—approximately 52-54 per cent.
Space heating including supplementary heating for day rooms and single-bed wards.
Mechanical ventilation with some cooling of the core and adjoining corridors.
Extract ventilation to the internal w.c's.
Mechanical ventilation for the single-bed wards (if required).
Hot, cold and drinking water.
Piped oxygen and vacuum for a proportion of the beds and in treatment rooms (see Building Note No. 4).
Lighting and power including lighting fittings, bedhead units; telephones, clocks, staff call, fire alarm systems; patients' call system; radio to bedhead units; television and radio aerial points in day rooms.
Tea boiler, hot plate, grill and hot closet, fire fighting equipment, incinerators (if required).

(ii) *Communications*

The areas on each floor taken up by stairs, lifts, large ducts, etc., and other areas which provide access between departments and to other floors (but which are not otherwise essential to the functioning of the ward as a unit) are to be dealt with as communication space.

(iii) *Engineering running costs*

The engineering running costs of race-track ward units can vary widely, but may well amount to about 50 per cent above those of the traditional type (single-corridor) ward unit.

(iv) *Semi-deep plan ward*

The cost allowance for the conventional type of plan described in Building Note No. 4 is applicable to the semi-deep plan ward [type E].

Hospital Building Notes Nos. 1 to 19
Adjustment of Departmental Cost Allowances

The DEPARTMENTAL COST ALLOWANCES shown in Appendix E to Building Note No. 2 should be increased by 9% in respect of all hospital departments covered by Building Notes Nos. 1 to 19 inclusive.

The revised basis of calculation will be adopted for all new Notes as they are published and all future reprints of existing Notes.

Ministry of Health
May, 1963.

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Printed in England for Her Majesty's Stationery Office by
The Campfield Press, St. Albans

Wt. 3696/9495. K.48.

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